



# **ET-102/ER-102**

## **GPS RECEIVER ENGINE BOARD**

### **PRODUCT GUIDE**

**Globalsat Technology Corporation (Taiwan)**  
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**USGlobalSat, Inc. (USA)**  
[www.usglobalsat.com](http://www.usglobalsat.com)



## **ET-102/ER-102 GPS BOARD Features**

- \* SiRF GPS Architecture
- \* SiRF StarII (X-Trac) High and low power consumption chip set
- \* SnapLock 100ms re-acquisition time
- \* Support standard NMEA 0183 protocol
- \* All-in-view 12-channel parallel processing
- \* Cold start under 45 seconds, average
- \* Optional build-in SuperCap to reserve system data for rapid satellite acquisition
- \* Superior urban canyon performance
- \* Foliage Lock for Weak signal tracking
- \* Built-in super cap to reserve system data for rapid satellite acquisition
- \* Full-duplex RS-232 port for navigation and control messages.
- \* Differential GPS capability through 2<sup>nd</sup> RS-232 port

## **SPECIFICATIONS**

### **Electrical**

#### **Characteristics**

#### **Receiver**

Frequency	L1, 1575.42 MHz
C/A code	1.023 MHz chip rate
Channels	12
Sensitivity	-170dBW



### Accuracy

Position	15 meters, 2D RMS, SA off 10 meters, 2d RMS, WAAS enable(SA off)
Velocity	0.1 m/s 95% (SA off)
Time	1 microsecond synchronized to GPS time

### Datum

Default	WGS-84
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### Acquisition Time

Reacquisition	0.1 sec., average
Hot start	8 sec., average
Warm start	38 sec., average
Cold start	48 sec., average

### Dynamic Conditions

Altitude	18,000 meters (60,000 feet) max
Velocity	515 meters /second (1000 knots) max

### Power

Main power input	3.3 Vdc ~ 5.5Vdc
Current supply	60mA typical 25mA on trickle power mode
Backup power	+2.5V to +3.6V
Backup current	10uA typical

### Serial Port

Ports	One for GPS, one for DGPS
Electrical level	TTL level (ET-102), Output voltage level: 0~3.5V RS-232 level (ER-102)
Communication	Full duplex asynchronous
Code type	ASCII
GPS Protocol	SiRf binary.NMEA 0183 changeable(Default:NMEA)
GPS Output Message	SiRf binary>> Position, Velocity, Altitude, Status and control NMEA 0183>> GGA,GSA,GSV,RMC(VTG and GLL are optional



GPS Transfer Rate      Software Command setting (Default:4800bps for NMEA)  
DGPS Protocol          RTCM SC-104,ver2.00, type 1,2 and 9

### Time Mark

Level                    TTL  
Pulse Duration        100ms  
Time Reference        At the pulse positive edge  
Measurement          Aligned to GPS sec., +/- 1us

**Active Antenna**                    --MCX, SMA, SMB, or others OEM specified connector available  
**Connector**

### Environmental Characteristics

#### Temperature

Operating                -40 deg. C to +80 deg. C  
Storage                  -40 deg. C to +85 deg. C  
Humidity                Up to 95% non-condensing

*All product specifications subject to change without notice.*

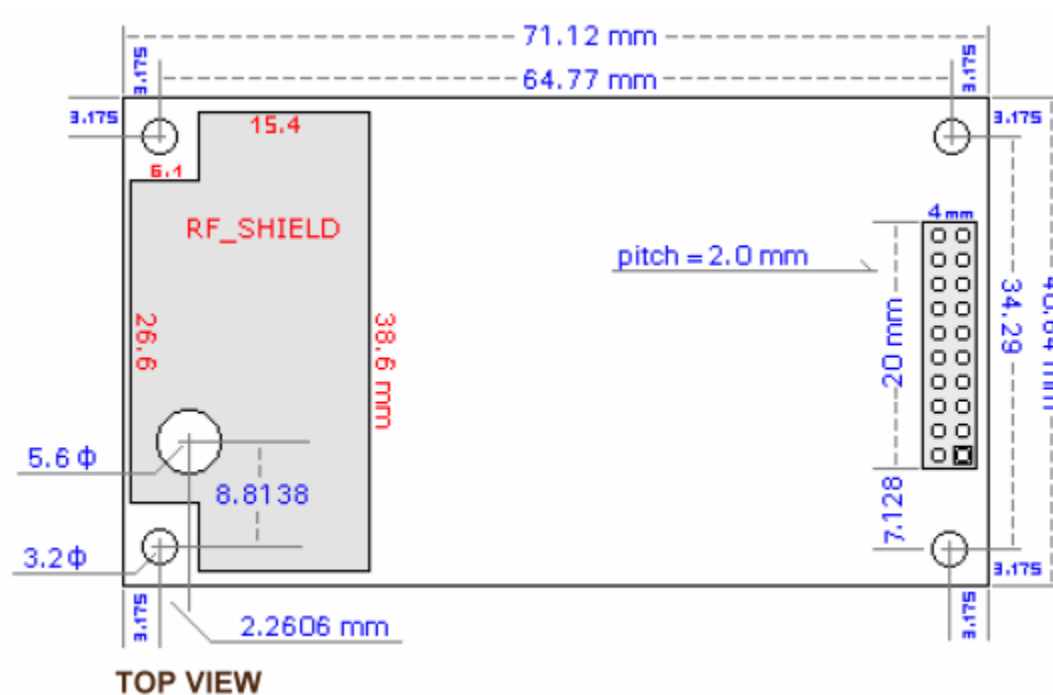
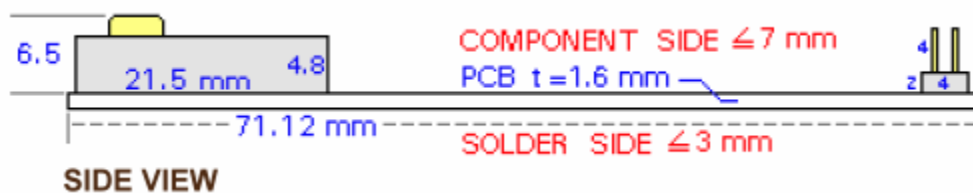
### PIN ASSIGNMENT

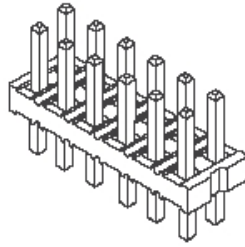
Pin No.	Name	Description	Type
1	VANT	Antenna DC Voltage	Input
2	VDC	3.8V~6.5V DC Power Input	Input
3	VBAT	Backup Battery	Input
4	VDC	(Shorted with pin 2)	Input
5	PBRES	Push Button Reset Input (Active Low)	Input
6	RESERVED	(Reserved)	
7	SELECT	Down-load data from RS232 to flash ROM (Reserved)	
8	RESERVED	(Reserved)	

<b>9</b>	RESERVED	(Reserved)	
<b>10</b>	GND	Ground	
<b>11</b>	TXA	Serial Data Output A (GPS Data)	Output
<b>12</b>	RXA	Serial Data Input A (Command)	Input
<b>13</b>	GND	Ground	
<b>14</b>	TXB	Serial Data Output B (No Used)	Output
<b>15</b>	RXB	Serial Data Input B (DGPS Data)	Input
<b>16</b>	GND	Ground	
<b>17</b>	RESERVED	(Reserved)	
<b>18</b>	GND	Ground	
<b>19</b>	TIMEMARK	1PPS Time Mark Output	Output
<b>20</b>	RESERVED	(Reserved)	

**DIMENSIONS**

21.5mm x 71.12mm x 7mm





**Male PCB Header**  
Digi-Key Part No: WM18841-ND

## **PIN DESCRIPTION**

**\*VANT:** DC Voltage is for active antenna.

**\*VDC (DC power input):** This is the main DC supply for a 3.8V~6.5V power module board

**\*VBAT (Backup Batter):** This is the batter backup that powers the SRAM and RTC when main power is removed. Typical current draw is 10uA. Without and external backup battery or Gold-capacitor, the module/engine board will execute a cold start after every turn on. To achieve the faster start- capacitor should be installed. To maximize battery lifetime, the battery Voltage should not exceed the supply voltage and should be between 2.5v and 3.6V.

**\*PBRES (Push-button reset):** This pin provides an active-low reset input to the engine board. It causes the engine board to reset and start searching for satellites

**\*SELECT:** Do not connect

**\*TXA:** This is the main transmits channel for outputting navigation and measurement data to user's navigation software or user written software.

**\*RXA:** This is the main receive channel for receiving software commands to the engine board from SiRfdemo software or from user written software. Normally this pin must be kept in High and if you don't use this pin please connect a resistor to 3.5V pull high



\***TXB**: No function as so far (Do not connect)

\***RXB**: This is the auxiliary receive channel for inputting differential corrections to the engine board to enable DGPS navigation.

\***Time Mark**: This pin provides one pulse-per-second output from the engine board that is synchronized to GPS time.

\***GND**: GND provides the ground for the engine boards. Connect all grounds

\*Others: **Do not connect.**

## NMEA OUTPUT COMMANDS

### GGA-Global Positioning System Fixed Data

Table B-2 contains the values for the following example:

\$GPGGA, 161229.487,3723.2475,N, 12158.3416,W, 1,07,1.0,9.0,M, 0000\*18

**Table B-2 GGA Data Format**

Name	Example	Units	Description
Message ID	\$GPGGA		GGA protocol header
UTC Time	161229.487		hhmmss.sss
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix	1		See Table B-3
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude <sup>1</sup>	9.0	meters	
Units	M	meters	
Geoid Separation <sup>1</sup>		meters	
Units	M	meters	
Age of Diff. Corr.		second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*18		
<CR><LF>			End of message termination

SiRF Technology Inc. does not support geoid corrections. Values are WGS84 ellipsoid heights.



**Table B-3 Position Fix Indicator**

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3	GPS PPS Mode, fix valid

### GLL-Geographic Position-Latitude/Longitude

Table B-4 contains the values for the following example:

\$GPGLL,3723.2475,N,12158.3416,W,161229.487,A\*2C

**Table B-4 GLL Data Format**

Name	Example	Units	Description
Message ID	\$GPGLL		GLL protocol header
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	n		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
UTC Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Checksum	*2C		
<CR><LF>			End of message termination

### GSA-GNSS DOP and Active Satellites

Table B-5 contains the values for the following example:

\$GPGSA,A,3,07,02,26,27,09,04,15,,,,,1.8,1.0,1.5\*33

**Table B-5 GSA Data Format**

Name	Example	Units	Description
Message ID	\$GPGSA		GSA protocol header
Mode1	A		See Table B-6
Mode2	3		See Table B-7
Satellite Used <sup>1</sup>	07		Sv on Channel 1
Satellite Used <sup>1</sup>	02		Sv on Channel 2
.....			
Satellite Used <sup>1</sup>			Sv on Channel 12
PDOP	1.8		Position dilution of Precision
HDOP	1.0		Horizontal dilution of Precision
VDOP	1.5		Vertical dilution of Precision

Checksum	*33		
<CR><LF>			End of message termination

(1. Satellite used in solution)

**Table B-6 Mode1**

Value	Description
M	Manual-forced to operate in 2D or 3D mode
A	2D automatic-allowed to automatically switch 2D/3D

**Table B-7 Mode 2**

Value	Description
1	Fix Not Available
2	2D
3	3D

## GSV-GNSS Satellites in View

Table B-8 contains the values for the following example:

\$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42\*71

\$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42\*41

**Table B-8 GSV Data Format**

Name	Example		Description
Message ID	\$GPGSV		GSV protocol header
Number of Messages <sup>1</sup>	2		Range 1 to 3
Message Number <sup>1</sup>	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1(Range 1 to 32)
Elevation	79	degrees	Channel 1(Maximum90)
Azimuth	048	degrees	Channel 1(True, Range 0 to 359)
SNR(C/No)	42	dBHz	Range 0 to 99,null when not tracking
.....			.....
Satellite ID	27		Channel 4 (Range 1 to 32)
Elevation	27	Degrees	Channel 4(Maximum90)
Azimuth	138	Degrees	Channel 4(True, Range 0 to 359)
SNR(C/No)	42	dBHz	Range 0 to 99,null when not tracking
Checksum	*71		
<CR><LF>			End of message termination

Depending on the number of satellites tracked multiple messages of GSV data may be required.

## MSS-MSK Receiver Signal

Table B-9 contains the values for the following example:

\$GPMSS,55,27,318.0,100,\*66

**Table B-9 MSS Data Format**

Name	Example	Units	Description
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Message ID	\$GMSS		MSS protocol header
Signal Strength	55	dB	SS of tracked frequency
Signal-to-Noise Ratio	27	dB	SNR of tracked frequency
Beacon Frequency	318.0	kHz	Currently tracked frequency
Beacon Bit Rate	100		Bits per second

The MSS NMEA message can only be polled or scheduled using the MSK MNEA input message.  
Reference "MSK-MSK Receiver Interface" (Note: Available upon request, not included in this document).

## RMC-Recommended Minimum Specific GNSS Data

Table B-10 contains the values for the following example:

\$GPRMC,161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598,,\*10

**Table B-10 RMC Data Format**

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTC Time	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	knots	
Course Over Ground	309.62	degrees	True
Date	120598		ddmmyy
Magnetic Variation <sup>2</sup>		degrees	E=east or W=west
Checksum	*10		
<CR><LF>			End of message termination

SiRF Technology Inc. does not support magnetic declination. All "course over ground" data are geodetic WGS48 directions.

## VTG-Course Over Ground and Ground Speed

Table B-10 contains the values for the following example:

\$GPVTG,309.62,T,,M,0.13,N,0.2,K\*6E

**Table B-11 RMC Data Format**

Name	Example	Units	Description
Message ID	\$GPVTG		VTG protocol header

Course	309.62	degrees	Measured heading
Reference	T		True
Course		degrees	Measured heading
Reference	M		Magnetic
Speed	0.13	knots	Measured horizontal speed
Units	N		Knots
Speed	0.2	Km/hr	Measured horizontal speed
Units	K		Kilometers per hour
Checksum	*6E		
<CR><LF>			End of message termination

*All specifications subject to change without notice.*